LIQUID PHASE HYDROSILYLATION OVER SIZE-CONTROLLED Pt NANOPARTICLES

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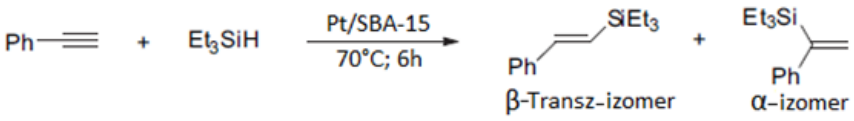
Abstract

Hydrosilylation reactions give important materials as high potential medical transfer molecules or additives in the rubber industry [1,2]. These reactions were based on homogeneous catalysts in the second half of the last century. Noble metal based heterogeneous catalysts were tested for such reactions since the 90's [3], however the effect of size controlled nanoparticles is unknown. In this study, Platinum nanoparticles with a diameter of 1.6, 4.8, 8.3 nm were anchored onto SBA-15 silica support and tested in phenylacetylene hydrosilylation with triethylene silane. The catalysts were characterized with Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) and Transmission Electron Microscope (TEM). The effect of the size of the Pt nanoparticles on the activity and selectivity of the liquid phase reactions were tested and monitored by Gas Cromatography (GC-MS). Based on our results it can be stated, that the 8.3 nm Pt nanoparticles is 10 times more active compared to the 1.6 nm Pt NPs. We also experienced striking differences in the selectivity of the products based on different sized Pt nanoparticles. Size controlled Pt nanoparticles can be the future for governing hydrosilylation reactions towards high activity and 100% selectivity.

Figure 1.: Schematic of the hydrosylilation reaction



[1] F. Alonso, et al., Journal of Organometallic Chemistry, 2010

[2] B. Marciniec, J. Gulinski, W. Urbaniak, Z.W. Kornetka, Comprehensive Handbook on Hydrosilylation, B. Marciniec (ed) Pergamon Press, Oxford, 754 (1992)

[3] Mario Pagliaro, Rosaria Ciriminna, Valerica Pandarus, and François Béland Eur. J. Org. Chem. 6227–6235, (2013)